Smart Choices for Cleaner Energy

The Green Energy Framework

NOVA SCOTIA
Energy

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Introduction

Nova Scotia faces two significant and related energy challenges - rising world demand for fossil fuels and increasing global greenhouse gas emissions.

Rising demand is straining world energy supply and creating the market conditions for dramatic and sudden price shifts. The summer of 2005 showed Nova Scotia – and the world as a whole – how volatile a supply-constrained market can be.

Marginal inventories, strained production capacity and relentlessly increasing demand – domestically and in emerging global markets – had already caused energy prices to climb. Consumers, businesses and utilities – public and private – were feeling the heat from increasing costs. Then Hurricanes Katrina and Rita removed oil and gas production and refineries in the United States from an already strained supply chain. The price of crude oil shot to $70 US per barrel, dragging other energy commodity prices with it.

The fall of 2005 has seen marginal reductions in petroleum product demand because of price pressure, but there is broad consensus among market observers that the days of cheap energy from fossil fuels – especially petroleum products – are over, for the foreseeable future.

This is especially troubling news for Nova Scotia where fossil fuels account for about 90 per cent of electrical energy production. Nova Scotians also rely heavily on fossil fuels for home heating, meaning increasing fuel commodity prices will hit Nova Scotians twice.

> Global energy demands are expected to grow by 60% over the next 25 years. This has the potential to cause a significant increase in greenhouse gas emissions associated with climate change.
>
> G8 Leaders Statement on Climate Change, 2005

The problems created by rising petroleum commodity prices and concerns over future converge with Canada's efforts to grapple with the problem of increasing greenhouse gas (GHG) emissions. GHGs are commonly held to be causing irreversible climate change. Governments around the world have agreed to reduce GHG emissions to reduce their effects on the world's climate.

GHG emission reduction requires significant change in how societies view energy consumption. The most significant change is the need to reduce the emissions associated with the use of fossil fuels.

There is new and stronger evidence that most of the warming over the last 50 years is attributable to human activities. Emissions of CO_2 due to fossil fuel burning are virtually certain to be the dominant influence on atmospheric concentrations during the 21st century.

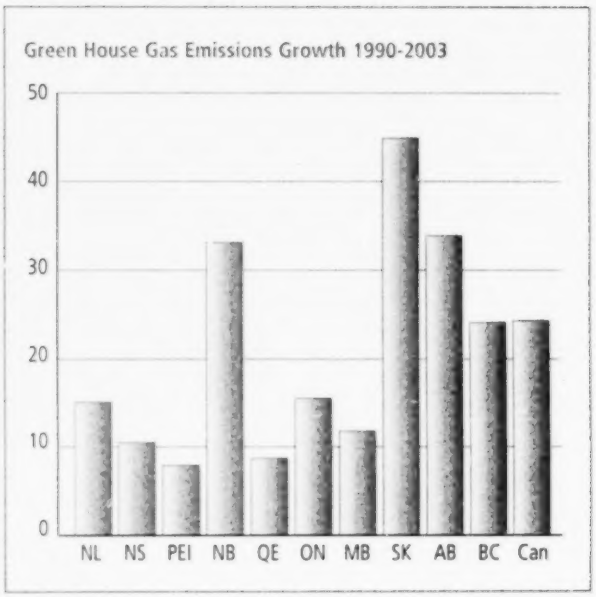
Intergovernmental Panel on Climate Change

Reduced consumption means lower GHG emissions and moderation of the effects higher commodity prices on individual, regional and national economies.

Getting to reduced consumption and reduced emissions requires that national solution. The federal government has taken an important first step toward developing that national solution. In April 2005, Environment Canada released the first phase of its Project Green - Moving Forward on Climate Change: A Plan for Honouring Our Kyoto Commitment. It is a plan for a healthy environment and competitive economy and is meant to encourage the integration of climate change considerations in day-to-day decisions of Canadians. Project Green laid the foundation for federal - provincial partnerships through the Partnership Fund introduced in Budget 2005.

In response, Nova Scotia has developed this document as a longer term framework to guide our approach to reducing emissions and fuel consumption consistent with Project Green. Its success will depend on a shared commitment by federal and provincial governments, local governments, institutions, utilities, industry and individual Nova Scotians to transform the way in which energy is produced and consumed in Nova Scotia. The document proposes several specific measures, but more importantly it establishes a flexible framework for encouraging the technological development and innovation that will help Nova Scotia's economy adjust to these rapidly changing circumstances.

We will need to be flexible and innovative because current technologies limit our options. Although our greenhouse gas emissions have increased at a slower rate than other provinces - 10.5 percent in 2003 over 1990 levels - the majority of our electricity generation comes from burning fossil fuels making electrical generation a significant source of GHG emission. Nova Scotia does not have the opportunity to to generate electricity from large scale hydroelectric prospects; and while our prospects for wind generation are very good, the wind cannot sustain the large, steady supplies of electricity that industry and homes require.



Nevertheless, Nova Scotia must be part of a national effort to reduce dependence on carbon-based fuels. Indeed, completing this framework will make Nova Scotia a model province for a less carbon intensive future by:

- Supporting strategic projects and essential infrastructure
- Creating new partnerships between governments and with the private sector, and
- Building a more competitive economy that relies on sustainability and innovation to make healthier communities

Highlights

The transformation to a greener energy future has two guiding principles.

- Nova Scotia's electrical generation system must dramatically increase its use of renewable energy and more efficient, cleaner generation technology.

- Nova Scotians must increase energy efficiency and conservation at home, in transportation systems and in the workplace;

These principles can be achieved by

- Transforming Nova Scotia's electrical system by:
  - maximizing the use of Nova Scotia's diverse renewable energy resources,
  - reducing emissions from conventional coal-fired generation
  - capitalizing on opportunities to increase generation efficiency through projects like the Halifax Community Energy Project
  - applying technology and innovation to make tomorrow's energy supply cleaner and more sustainable, and
  - improving our environment by reducing oil emissions.

- Helping Nova Scotians families cope, in the long term, with rising energy costs through energy efficiency and conservation.

- Making government a leader-by-example in energy efficiency and responsible, sustainable management.

- Improving the efficiency of electrical energy use to delay the need for new generation while new technologies and innovative approaches can be developed.

- Finding more environmentally responsible ways of meeting the transportation needs of Nova Scotians and Nova Scotian businesses.

- Increasing the use of renewable energy by individual Nova Scotians and Nova Scotia businesses, industry and institutions.

- Preparing for future climate change through better understanding of our vulnerabilities and available adaptation measures.

Key Elements

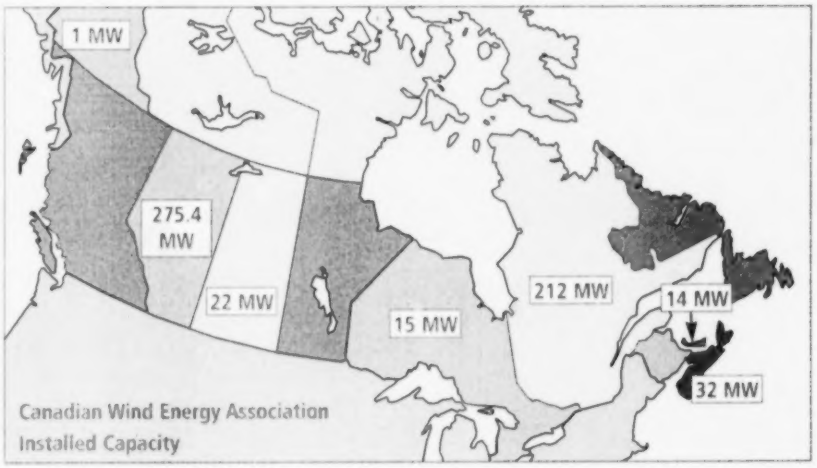
Transforming Nova Scotia's Electrical System

We are proposing the transformation of our electricity generation system to one that relies less on carbon-intensive energy sources. It is a roadmap for developing new electricity supplies for Nova Scotians and a template for the "greening" of our electricity system over the longer term. There are five broad activities that we will undertake to change Nova Scotia's electrical system:

1. Create a diverse mix of renewable energy sources

Nova Scotia has one of Canada's best wind regimes, some of the highest tides in the world, and undeveloped biomass resources. These present opportunities for Nova Scotia to become a leading producer of green, renewable energy.

We can begin by maximizing our wind power potential.



During the next decade, we could realistically add as much as 280 megawatts of new wind power to the 100 megawatts currently being developed in our province. This would require an investment of more than $500 million, including improvements to our electricity transmission system in Nova Scotia.

Increasing electrical power generation from biomass in partnership with large industry is another possibility. There are currently several large biomass projects located at, or adjacent to, pulp and paper operations in the province, including the 25 megawatt Brooklyn Energy facility. We have identified the potential for 20 megawatts of biomass co-generation in northern Nova Scotia area as well as potential for additional biomass electricity generation in Cape Breton as projects that may be able to move forward in the coming years. We will also explore additional opportunities to increase biomass-based electricity generation, particularly in the forest products sector.

Although Nova Scotia has no large hydroelectric opportunities, there are other opportunities for other water-based power generation. Currently, we have one of only two tidal power stations in the world at the 20MW facility at Annapolis. The potential of new, low impact tidal power technologies is currently being studied. Ongoing efforts to maximize production from existing small hydro opportunities through facility improvements are helping maximize our renewable energy sources. Realizing these opportunities could require investment of $20 million in the short and medium-term.

2. Increase the efficiency of energy generation

Halifax Regional Municipality has a unique opportunity to build a community energy system that will deliver a number of benefits including significant greenhouse gas reduction, improved air quality for city residents, and extending natural gas distribution to the peninsula of Halifax.

The potential for gas-fired co-generation serving hospitals, universities and other large facilities may be as great as 50 megawatts.

Nova Scotia has partnered with Halifax Regional Municipality a fund a study to confirm the business plan for the first phase of this project - a 14 megawatt heat and power plant that would serve Halifax Infirmary, Victoria General Hospital, Dalhousie University and St. Mary's University. If this community energy project moves forward, there will be significant engineering, construction, and design activities that will generate economic spin-offs in the municipality.

There are opportunities for Nova Scotia Power to add waste heat recovery to two small gas-fired combustion turbines located at Tufts Cove Thermal Generating Station. This would increase natural gas-fired energy use while displacing heavy fuel oil or solid fuel. An additional 50 megawatts of gas-fired power could be added with this project.

3. Emission reductions from current coal-fired power stations

Nova Scotia needs to reduce emissions from existing coal-fired power stations if we are to achieve a more sustainable future.

How far and fast we can reduce these emissions will depend in large measure on the rules under which the federal government will regulate large GHG emitters across the country. With proper incentives and recognition of displaced coal under the GHG Offsets Program, it may be possible to reduce GHG emissions by as much as 1 million tonnes per year.

4. Applying technology and innovation to clean tomorrow's energy supply

Underground sequestration of carbon is seen by many as a key component in the management of carbon dioxide emissions from large industrial facilities such as coal-fired power plants. Nova Scotia needs to assess the potential of carbon capture and storage through research and demonstration work projects.

We are supporting the efforts of Dalhousie University, Nova Scotia Power, and others to establish a carbon storage and capture research facility in Nova Scotia.

The province now boasts the only circulating fluidized bed coal-fired power station in Canada at Point Aconi. We will continue to investigate clean coal opportunities - including generation facilities fired by coal and biomass, advanced technologies that would both improve overall efficiency and address sulphur dioxide, oxides of nitrogen and mercury emissions.

5. Improving our environment by reducing all emissions

In addition to GHG reduction, Nova Scotia is committed to achieving significant reductions in sulphur dioxide, oxides of nitrogen and mercury. Projects to improve generation efficiency will help, but conventional technology will still be required while longer term changes to generation are made. Flue gas desulphurization technologies may still be necessary at selected coal stations to meet future emission targets even with growth in renewables and increased generation efficiency.

Nova Scotia Energy Efficient Housing Program

Nova Scotia's has some of the oldest homes in the country and about 60 per cent of them are heated by oil. This combination provides a major opportunity to reduce energy use and greenhouse gas emissions in housing - perhaps by as much as 30 per cent per household. This framework will support the efforts of Nova Scotians to reduce residential energy use with a focus on economically disadvantaged Nova Scotians and those who live in the province's 11,000 seniors and family housing units.

We want to build upon recently announced federal government support for grants to help those on low income improve energy efficiency as well as help all Nova Scotians reduce energy use, and, therefore, cost, in the home.

The energy efficient housing program includes:

- Energy efficiency improvements for low-income homeowners and those in rental accommodations;

- Energy efficiency building improvements for non-profit organizations, especially social and charitable organizations serving the disadvantaged; and

- Improvements in the energy performance upgrading of the province's 11,000 seniors and family housing units which have annual energy and water costs of $14.5 million.

- Co-operation with the federal government to ensure all Nova Scotians have access to information and incentives to reduce energy use in the over the longer term.

We also want to support those building and purchasing new homes to ensure they are as energy efficient as possible.

Nova Scotia wants to provide continued support for the R-2000 Home Program and EnerGuide for New Houses. These programs help Nova Scotians make the right choices about energy efficiency when planning or buying a new home. By matching the federal EnerGuide for Houses Grant program, as many as 5,000 homes could receive energy efficiency upgrades every year over over the next five years. This could reduce greenhouse gas emissions by as much as 40,000 tonnes annually.

Leading by Example

Government will become a leader-by-example in energy efficiency and responsible, sustainable management over the long term through:

- Effectively managing government's use and purchase of energy;
- Purchasing products and services that are environmentally responsible, including renewable energy and alternate fuels;
- Co-ordinating energy demand management activities in the province;
- Taking a more strategic approach to climate change in government operations and long-term economic and environmental policy development; and,
- Encouraging the use of more energy efficient transportation options, including rail, for the movement of goods and people.

To become a leader in energy efficiency, government proposes funding initiatives for:

- Energy efficiency improvements for existing government facilities and government funded facilities (hospitals, universities and schools);
- Smarter procurement of energy supplies;
- Use of renewable energy and alternate fuel sources by government;
- Procurement of less energy-intensive and more environmentally responsible goods and services;
- Understanding the impacts of climate change on its operations; and,
- Evaluating transportation options that can contribute to our climate change goals.

We estimate that there is the potential to invest as much as $100 million over the next 10 years in making energy efficiency improvements in government buildings and those operated in whole or in part with provincial government funding.

This level of investment may lead to permanent energy cost savings of as much as $17 million annually and greenhouse gas reductions estimated at 20,000 tonnes annually.

Reducing Electricity Demand

An aggressive program to maximize the efficiency of electrical energy use will delay the need for new generation while new technologies and innovative approaches can be developed.

Nova Scotia does not currently have a coordinated energy efficiency and demand- side management (DSM) program like ones currently in place in other jurisdictions in North America. Research shows that electricity demand-side reductions can be competitive with new supply options. In fact, DSM may be the lowest cost "supply" option available to Nova Scotia.

Electrical energy efficiency and conservation measures are among the least expensive means of achieving reductions in emissions from electricity generation. Energy efficiency and conservation can yield significant financial savings for industrial and residential customers. Furthermore, energy efficiency improvements create jobs.

Nova Scotia must move forward with a broad-based program to encourage electrical energy efficiency and conservation in all sectors - residential, commercial, and industrial. The potential for energy and emissions reduction is significant. In other jurisdictions, aggressive programs target reductions of about one per cent of demand annually. In Nova Scotia, that would equate to about 12.5 million kilowatt hours and a reduction as great as 100,000 tonnes of carbon dioxide emissions every year.

Nova Scotia Power Inc. is taking steps to implement a conservation and demand-side management program to help Nova Scotians realize emission reductions. The utility has included a $5 million program in its current rate application, and is consulting with the public and other key stakeholders on how best to manage this investment.

We are encouraging and participating in the current NSPI-led consultation.

We will also be developing programs that target other electrical energy uses where there is potential for immediate and low-costs energy savings.

The demand reduction program could include:

- Public education and outreach on the opportunities for reducing energy use;
- Community-based social marketing of selective energy efficiency measures to increase public participation in energy efficiency and conservation; and
- Incentives to encourage the purchase of only the most energy efficient appliances and equipment by all sectors of the economy

Sustainable Transportation

Transportation accounts for about 30 per cent of Nova Scotia's energy use -- second only to the electricity sector. There are many ways in which the transportation sector's energy efficiency can be improved. Our vision for more sustainable transportation includes:

- Developing better quality transportation options for Nova Scotians to increase ridership and public acceptance;
- Creating the right environment for the development of alternative transportation fuels to help reduce greenhouse gas emissions within a competitive environment;
- Helping Nova Scotians make the right transportation choices by encouraging the purchase and use of fuel-efficient vehicles and encouraging participation in other environmentally responsible transportation options;
- Creating alternatives to private vehicle use in more Nova Scotia communities;
- Establishing better links between existing urban transit systems and outlying communities; and,
- Examining rail potential as part of new industrial development opportunities

We recognize that many Nova Scotians do not have access to public or private transit services. To help more Nova Scotians make public transit choices, we want to build on successes like the Halifax Regional Municipality's Bus Rapid Transit Program - an award winning project that is part of Canada's Urban Transportation Showcase - and build on the existing municipal transit systems in the Annapolis Valley and the Cape Breton Regional Municipality.

We also have an opportunity to increase production and consumption of Nova Scotia produced bio-fuels such as the bio-diesel made by Ocean Nutrition in Mulgrave and now used in transit buses and government buildings.

Active transportation options are also important. Walking, cycling, and other forms of active transportation can be encouraged by developing better trails and routes. Nova Scotians would benefit through a better environment and healthier lifestyle.

The transportation component of a greener energy future should be developed in harmony with our economic development needs. Nova Scotia stands at the gateway to North America from Europe and other markets. Our economic future relies on improving transportation infrastructure for moving goods and people within Nova Scotia, to North America and to world markets in a sustainable and efficient manner.

Renewable and Alternative Energy for Individuals, Business and Institutions

While we have seen dramatic increases in renewable energy use in the power generation sector and expect to see even more significant additions of renewable energy in the future, there has been minimal renewable energy use in buildings.

The province has introduced programs to increase the use of renewable energy in homes and buildings:

- The Department of Energy recently announced support for solar domestic water heating in homes and in commercial and institutional buildings and for solar air systems in buildings.
- The Department also announced incentives for the purchase of energy-efficient, low -emissions wood stoves in homes.
- In co-operation with Solar Nova Scotia, we have consistently supported the use of passive solar energy in homes and helped fund the development of a nationally recognized passive solar home design course and accompanying video.

- We have worked closely with Nova Scotia Power to streamline requirements so that individuals and business in Nova Scotian can generate their own electricity and sell it directly to the grid. This net metering option for systems of less than 100 kilowatts offers full residential or commercial rates to those wishing to generate their own electricity and made possible projects such as the 65 kilowatt wind turbine recently installed in Amherst to provide power to the RCMP detachment.

But there is more to be done to tap Nova Scotia considerable renewable energy potential.

We have identified a number of opportunities and we will examine how to encourage their development in the future. These include:

- Greater use of renewable energy, including passive and active solar and in new and existing government facilities;
- Demonstration of on-farm energy generation such as bio-gas production from wastes and waste products;
- Increased participation by farms and businesses using renewable energy in the net metering program;
- Stronger partnerships to encourage greater use of renewable energy, especially passive solar, in new home design and construction;
- Greater use of advanced glazing systems that use solar energy for lighting, heating and ventilation in new buildings;
- Developing community-based approaches to the use of renewable and alternative energy.

Preparing for and Adapting to Climate Change

Atmospheric concentrations of carbon dioxide have increased more than 30 per cent in the past 150 years and will continue to rise even if greenhouse gas emissions were stabilized at current levels tomorrow.

There is a high probability that climate change during the next 100 years may exceed anything experienced in the past 8,000 years. The possible effects include more heat waves, fewer cold waves, and increased flooding as a result of more intense precipitation events.

Nova Scotia has just completed an assessment of potential impacts and vulnerabilities to climate change. Adapting to a Changing Climate in Nova Scotia: Issues Paper, examines what climate change could mean to our province and lays out a framework for preparing and adapting to climate change.

A number of departments have already discussed potential consequences and vulnerabilities and identified how a changing climate may affect the operation of government in the future.

We must make progress on a number of fronts if we are to better understand future potential impacts and develop appropriate strategies that are effective for a range of future climates. Among the issues we will have to address are:

"Average summertime temperatures in Atlantic Canada could increase by as much as three to four degrees [Celsius] over the next 80 years. These changes would have enormous impacts on the lives of the people of Atlantic Canada and the ecosystems that support them." Environment Canada

- Better information on how climate change will affect Nova Scotia;
- Understanding how extreme weather events should influence the design of infrastructure and facilities;
- More information on how a rising sea level rise will affect our coastal communities, infrastructure, coastline, and eco-systems;
- Assessing how climate change will affect government-funded projects, operations, and finances;
- Greater co-operation with communities in preparing for future climate scenarios;
- More support for preparing of adaptation strategies and options for various economic sectors, especially those based on natural resources.

At the municipal level, we have already started work as part of the "Climate $mart" project in Halifax Regional Municipality. This project's goal is making climate change mitigation and adaptation an integral part of municipal decision-making.

The federal government's current plan Project Green - A Plan for Honouring our Kyoto Commitments does not consider how Canadians should adapt to climate change. We want to cooperate with the Government of Canada to provide Nova Scotians with the information and advice they need to prepare properly for a changing climate.

Next Steps

Nova Scotia is pursuing partnership and funding opportunities with the federal government consistent with the objectives outlined in Project Green. Nova Scotia must seize this important opportunity. Nova Scotia's proposal for action on climate change is ambitious and innovative. They require significant investment and a shared commitment from the federal government, and strategic partnerships with municipalities and industry.

The Department of Energy has engaged the federal government in discussions to move this comprehensive vision on energy efficiency, alternative energy, and climate change forward. Although no firm commitments have been made to date, the Department of Energy is optimistic that both levels of government can reach an agreement to bring these ideas to reality so Nova Scotia can begin taking real action on climate change and energy efficiency now, and for the long-term.

Table 1A. Smart Choices for Cleaner Energy

Key Elements - Generation Framework	Possible Time Frame	Potential Annual GHG reductions (tonnes)	Potential annual sulpher dioxide reductions (tonnes)
Reduce emissions from existing coal-fired power stations	beginning in 2008	up to one million tonnes of CO2E	
Halifax natural gas co-generation/ district heating - up to 50 MW	start in 2007	up to 138,000 (heating) + 80,000 (electricity)	1,800 (heating) + 5,200 (electricity)
Northern Nova Scotia biomass co-generation/ district heating - 20 MW	starting in 2009	up to 16,200 (heating) 125,000 (elect)	390 (heating)
New Wind: Coastal; CB Highlands - up to 280 MW	starting in 2007	up to 700,000	Reductions through coal displacement
Transmission upgrade for wind power	starting in 2007	——	Reductions through coal displacement
Tufts Cove #6 (waste heat recovery)	starting in 2008	up to 96,000	2,000
Flue gas desulfurization (300 MW)	starting in 2009	——	35,000
Tidal Flow Pilot	depends on current study, possible pilot in 2007-2008	——	
Carbon capture & storage R& D	research to start in 2006		* up to 64,120 tonnes
Sub-total over 15 years	——	*up to one million tonnes	

*note reductions from coal-fired power would be possible through increased wind power, waste heat recovery, biomass co-generation, and Halifax Community Energy Project. Reductions are not cumulative.

Glossary

active solar - uses solar energy to actively convert sunlight into other forms of energy.

bio-fuels - renewable energy produced by converting the complex carbohydrates from organic matter into energy.

biomass - organic matter available on a renewable basis. Biomass includes forest and mill residues, agricultural crops and wastes, wood and wood wastes, animal wastes, livestock operation residues, aquatic plants, fast-growing trees and plants, and municipal and industrial wastes.

carbon doixide (CO_2) - this gas is released into the atmosphere through natural processes of plant and animal life and through human activities, mainly the burning of fossil fuels and other materials. It is the main contributor to climate change.

cogeneration - an energy system that consumes a fuel, like natural gas, to produce electricity and thermal energy in the form of steam or hot air. Cogeneration systems use heat energy that would otherwise be wasted.

demand-side management (DSM), electricity demand-side - a program, usually led by utilities, to reduce consumer energy use by promoting energy conservation and efficiency.

flue gas desulfurisation - is technology that uses a sorbent, usually lime or limestone, to remove sulfer dioxide (SO_2) from the gases produced by burning fossil fuels. Flue gas desulfurisation is current state-of-the-art technology for major SO_2 emitters, such as power plants.

greenhouse gas emissions, GHG - greenhouse gases are any gases that absorb infra-red radiation in the atmosphere. Greenhouse gases include water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_{20}), halogenated fluorcarbons. ozone, perfluorinated carbons, and hyrdofluorcarobons, These gases absorb the earth's infrared radiation and warm the atmosphere. Some GHGs occur naturally, but are also produced by human activities, particularly the burning of fossil fuels. When GHGs

build up in the atmosphere, they are widely believed to affect climate and weather patterns.

hydro electric - the creation of power through use of energy of falling water to turn an electric generator.

kilowatt (KW) - One thousand watts, or the power needed to light ten 100-watt lightbulbs

megawatt (MW) - One thousand kilowatts of power. One megawatt of electricity is enough to power 100 homes at peak demand times (such as supper hour).

passive solar - is the technology of heating and cooling living spaces. Heat rises and cold air falls, passive solar products, systems, and designs use these basic principles of nature.

R-2000 - is a housing standard that demands a high level of energy efficiency, approximately 40 per cent above building code requirements. It is based on an energy consumption target for each house and a series of technical requirements for ventilation, air-tightness, insulation, choice of materials, and water use.

renewable energy - refers to energy derived from non-fossil fuel resources (excluding nuclear). It includes wind, biomass, and hydro, solar, and geothermal.

turbine - a device that captures the energy of movement - falling water, tidal currents, the wind - and uses it to turn a shaft. The rotation of the shaft can be used to generate electricity.

watt - a unit of power, such as a 100-watt light bulb

wind power - wind power is generated through the use of a turbine, usually mounted on a tower. The turbine collects wind energy and converts it to electricity.